

556461

A Deep X-Ray Survey of Low Mass PMS Stars in NGC 2264

Grant NAG5-10565

Annual Performance Report No. 1

For the period 15 March 2001 through 14 March 2002

Principal Investigator:

Dr. Brian M. Patten

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Smithsonian Institution
Astrophysical Observatory
Cambridge, Massachusetts 02138-1596

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The NASA Technical Officer for this grant is Dr. Richard Mushotzky, Mailstop 662.0, NASA Goddard Space Flight Center, Greenbelt MD 20771

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This is the first annual performance report for our grant “A Deep X-Ray Survey of Low Mass PMS Stars in NGC 2264.”

1. Brief Description of the Primary Objectives and Scope of the Project

Brian Patten is the Co-Investigator of the XMM Guest Investigator proposal, “A Deep X-Ray Survey of Low Mass PMS Stars in NGC 2264” (Ted Simon, University of Hawaii, is the PI). We have proposed to make a deep X-ray survey of a rotation- and proper-motion selected sample of young (3-15 Myr old), low-mass, PMS stars in the populous star-forming region NGC 2264. These XMM data will be combined with an extensive set of rotation data for members of this cluster to allow us, for the first time, to probe the early evolution of magnetic dynamo activity for both fully convective stars and those stars found lower on their Hayashi tracks, which are developing radiative cores. We will use these data to study the interrelationship between rotation, interior structure, and coronal activity as a function of mass and age in the PMS and to define empirical constraints for theoretical models of angular momentum/dynamo evolution.

2. Progress Report

The XMM observatory has completed one of two observations in NGC 2264. In March 2001 XMM observed the first position in the cluster called “NGC 2264 north” for a total time of 36620 seconds. Due to difficulties with the pipeline processing software at the XMM Science Center, these data were not delivered to the PI (and Co-I) until late-September 2001. The second observation of the cluster (“NGC 2264 south”) has been delayed due to problems (recently resolved) with one of the cameras onboard the spacecraft. We have spent the last couple of months of 2001 acquiring the necessary software and documentation for the analysis of the first set of data. Our time has mostly been spent in familiarizing ourselves with the pipeline data products and seeking additional software tools which will be used for the detailed data reduction and analysis.

3. Anticipated Activities for 2002

We eagerly await the second set of NGC 2264 data. While the second observation of the cluster was delayed due to problems with EPIC cameras on XMM, we are anticipating the observation will be rescheduled for early-mid 2002.

In the meantime, we continue our efforts to analyze data from the first observation. Anticipated tasks are as follows: (1) Recalibrate or reprocess XMM images from each of four EPIC cameras at both boresight pointings of XMM as necessary, (2) Extract X-ray photometry and spectra for individual X-ray sources in all images produced by these observations, (3) Determine optical counterparts to individual X-ray sources by cross-matching XMM positions with RA and decl. coordinates of cluster members/nonmembers identified from ground-based proper motion surveys, (4) Examine the relationship between the observed X-ray brightness of individual stars with their location within the H-R Diagram and hence with the mass, age, and internal structure of each star (amongst other things).